

# Model photo-responsive elastomers based on the self-assembly of side group liquid crystal triblock copolymers (Presentation Recording)

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## ABSTRACT

We report the synthesis of azobenzene-containing coil-liquid crystal-coil triblock copolymers that form uniform and highly reproducible elastomers by self-assembly. To serve as actuators to (non-invasively) steer a fiber optic, for example in deep brain stimulation, the polymers are designed to become monodomain “single liquid crystal” elastomers during the fiber-draw process and to have a large stress/strain response to stimulation with either light or heat. A fundamental scientific question that we seek to answer is how the interplay between the concentration of photoresponsive mesogens and the proximity to the nematic-isotropic transition governs the sensitivity of the material to stimuli. Specifically, a matched pair of polymers, one with ~5% azobenzene-containing side groups (~95% cyanobiphenyl side groups) and the other with 100% cyanobiphenyl side groups were synthesized from identical triblock pre-polymers (with polystyrene end blocks and 1,2-polybutadiene midblocks). These can be blended in various ratios to prepare a series of elastomers that are precisely matched in terms of the backbone length between physical crosslinks (because each polymer is derived from the same pre-polymer), while differing in % azobenzene side groups, allowing the effect of concentration of photoresponsive groups to be unambiguously determined.

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